


Memorandum

To : Marley Hart, Executive Officer
Occupational Safety and Health Standards Board
2520 Venture Oaks Way, Suite 350
Sacramento, CA 95833

Date: September 20, 2013

From : Juliann Sum, Chief 
Division of Occupational Safety and Health

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SEP 26 2013

Subject: Division Evaluation of Petition
Joel A. Goldman, Petition File No.534

**OCCUPATIONAL SAFETY AND HEALTH
STANDARDS BOARD**

This memorandum is written in response to the petition received from the Occupational Safety and Health Standards Board on May 21, 2013, regarding the request from Joel A. Goldman representing Alimak Hek, Inc. to revise sections 1604.1(c)(1), and add new subsections 1604.20(i) and 1604.27(c) of the Construction Safety Orders applicable to Construction Personnel Hoists (CPH). The Petitioner requests that the standards for servicing and maintaining permanently enclosed speed governors be performed only by the manufacturer.

Existing Standards:

1604.1 (c) Engineering Supervision.

(1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a professional engineer competent in the field.

1604.20 (a) Requirement for Governors and Location.

Car safeties, and counterweight safeties, where furnished, shall be actuated by a speed governor. The governor shall be located where it cannot be struck by the car or the counterweight in case of over-travel and where there is adequate space for full movement of governor parts.

(b) Tripping Speeds.

(1) Car Governors.

Governors for car safeties shall be set to trip at overspeeds as follows:

(A) At not less than 115% of rated speed.

(B) At not more than the tripping speed listed opposite the applicable rated speed in Table 3. Maximum tripping speeds for intermediate rated speeds shall be determined from Figure 3.

(2) Counterweight Governors.

Governors for counterweight safeties, where provided, shall be set to trip at an overspeed greater than, but not more than 10% above, that at which the car speed governor is set to trip.

(c) Sealing and Painting.

Governors shall have their means of speed adjustment sealed after test. If speed governors are painted after sealing, all bearing and rubbing surfaces shall be freed of, or kept free from, paint and a hand test made to determine that all parts operate freely as intended. Seals shall be of a type which will prevent readjustment of the governor-tripping speed without breaking the seal.

(d) Governor Overspeed and Safety Switches.

(1) A switch shall be provided on the governor and operated by the overspeed action of the governor. A switch shall be provided on the governor when used with a counterweight safety. Every car safety shall be provided with a switch operated by the car safety mechanism when the safety is applied. These switches shall, when operated, remove power from the driving-machine motor and brake before, or at the time of, application of the safety. The governor overspeed switch and the safety switch may be the same switch on rack and pinion safeties.

EXCEPTION: A period of five years from the effective date of these orders will be allowed during which the overspeed switch on existing governors may be omitted where the governor is of a type not designed to operate a switch.

(2) The setting of the car governor overspeed switch shall conform to the following requirements:

(A) The car governor overspeed switch shall open in the down direction of the hoist at not more than 100% of the speed at which the governor is set to trip in the down direction.

(B) The switch, when set as specified in Section 1604.20(d)(2)(A), shall open in the up direction at not more than 100% of the speed at which the governor is set to trip in the down direction.

EXCEPTION: Rack and pinion safeties.

(3) Switches used to perform the functions specified shall be positively opened and shall remain in the open position until manually reset. Switches operated by the car safety mechanism shall be of a type which will not reset unless the car safety mechanism has been returned to the "off" position.

(e) Governor Ropes and Tripping Mechanisms.

(1) Material and Factor of Safety.

Governor ropes shall be of iron, steel, nickel-copper alloys (Monel Metal, or the equivalent), phosphor bronze, or stainless steel, of regular lay construction, and shall be not less than 3/8-inch in diameter. Tiller rope construction shall not be used.

The factor of safety of governor ropes or governor-tripping mechanisms shall be not less than five.

(2) Replacement of Existing Governor Ropes.

Replacement governor ropes shall be of the same size, material, and construction as the rope originally furnished by the hoist manufacturer, except that a rope of the same size but of either different material or construction may be employed provided there is conformance with the requirements of Section 1604.20(g) and a test is made of the car or counterweight safety and speed governor with the new rope to demonstrate that the safety will function as required by Section 1604.19(b).

(3) Governor Rope Clearance.

During normal operation of the hoist, the governor rope shall run free and clear of the governor jaws, rope guards, or other stationary parts.

(4) Splicing Governor Ropes. Governor ropes shall not be lengthened or repaired by splicing.

(f) Design of Governor Jaws.

Type B and C car and counterweight safeties shall be actuated by a governor equipped with rope-grip jaws which will permit the governor rope to pull through the jaws. The maximum tension in the governor rope to cause it to slip through the governor jaws shall not exceed $1/5$ of the rated ultimate strength of the rope. Governor jaws shall be of such shape and minimum length that no appreciable damage to, or deformation of, the rope shall result from the stopping action of the jaws in operating the car or counterweight safety.

(g) Design of Speed Governor Sheaves and Traction Between the Speed Governor Rope and Sheaves. The arc of contact between the governor rope and the governor sheaves shall, in conjunction with a governor-rope tension device, provide sufficient traction to cause proper functioning of the governor. Governor-sheave grooves shall have machine-finished surfaces. Governor tension sheaves shall have machine-finished grooves for rated car speeds of more than 200 feet per minute. Machined governor-sheave grooves shall have a groove diameter of not more than $1 \frac{1}{8}$ times the diameter of the governor rope. The pitch diameter of governor sheaves and governor tension sheaves shall be not less than the product of the diameter of the rope and the applicable multiplier in the following list, based on the rated speed and the number of strands in the rope:

<i>Rated Speed</i>	<i>No. of Strands</i>	<i>Multiplier</i>
200 feet per minute or less	6	42
200 feet per minute or less	8	30
Over 200 feet per minute	6	46
Over 200 feet per minute	8	32

(h) Governor Marking Plate.

A plate shall be securely attached to each governor and shall be marked in a legible and permanent manner with letters and figures not less than $1/4$ -inch in height, indicating the following:

- (1) The speed, in feet per minute, at which the governor is set and sealed to trip the governor rope-grip jaws.
- (2) The size, material and construction of the governor rope on which the governor jaws were designed to operate.

1604.27. Overhead Beams, Foundations, and Flooring Over Hoistway.

(a) Overhead Beams and Foundations.

Overhead beams and foundations for the direct support of the machinery or sheaves, or both, shall conform to the following requirements:

(1) Beams and Supports Required. Machines, machinery, and sheaves shall be so supported and maintained in place as to effectually prevent any part from becoming loose or displaced under the conditions imposed in service. Supporting beams, if used, shall be of steel or reinforced concrete. Beams are not required under machines, sheaves, and machinery or control equipment which are supported on floors, provided such floors are designed and installed to support the load imposed thereon.

(2) Overhead Beams, Floors, and Their Supports.

Overhead beams, floors, and their supports shall be designed for not less than the sum of the following loads:

(A) The load resting on the beams and supports which shall include the complete weight of the machine, sheaves, controller, governor, and any other equipment, together with that portion, if any, of the machine room floor supported thereon.

(B) Twice the sum of the tensions in all wire ropes supporting the car, passing over sheaves or drums supported by the beams, with rated load in the car.

(3) Foundations, Beams, and Floors for Machinery and Sheaves Not Located Directly Over the Hoistway. For machines and sheaves located below, or at the sides of, the hoistway, the foundation for the machine and sheave beams and their supports shall be designed to withstand loads as follows:

(A) The foundation shall support the total weight of the machine, sheaves, and other equipment, and the floor, if any.

(B) The sheave beams and the foundation bolts shall withstand twice the vertical component of the tensions in all hoisting ropes passing over sheaves or drums on the foundation or beams, less the weight of the machine or sheaves.

(C) The sheave beams and the foundation bolts shall withstand twice the horizontal component, if any, of the tensions in all hoisting ropes passing over sheaves or drums on the foundation or beams.

(D) The foundation shall withstand twice the overturning moment, if any, developed by the tensions in all the hoisting ropes passing over sheaves or drums on the foundation or beams.

(4) Securing of Machinery and Equipment to Beams, Foundations, or Floors.

(A) Overhead Beams and Floors. Machinery or equipment shall be secured to, and supported on or from the top of, overhead beams or floors.

EXCEPTIONS:

1. Secondary or deflecting sheaves of traction hoists.
2. Devices and their accessories for limiting or retarding car speed.

(B) Beams or Foundations Supporting Machinery and Sheaves Not Located Directly Over the Hoistway.

Machines and sheaves located below, or at one side of, a hoistway shall be anchored to beams, foundations, or floors with bolts, shall conform to American National Standard Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners, G38.5-1969 (ASTM A307-68), and shall be of sufficient size and number to withstand the applicable load conditions specified under Section 1604.7(a)(2). Based on these initial loads, total tension in anchor bolts shall not exceed 12,00 lb./in.² of net section, and the total shear shall not exceed 8,600 lb./in.² of actual area in the shear plane. Where bolts are used through sloping flanges of structural shapes, the bolt heads shall be of the tipped or beveled-head type or shall be fitted with beveled steel washers, and nuts on sloping flanges shall seat on beveled steel washers.

EXCEPTION: Bolts made of steel having a greater strength than that specified by American National Standard G38.5-1969 (ASTM A307-68) may be used and the maximum allowable stresses increased proportionally based on the ratio of the ultimate strengths. Elongation must conform to the requirements of the corresponding American National Standard.

(C) Overhead Hoisting Rope Hitches.

Where hoisting ropes are secured to the structure above a hoistway, the hitch plates and hitch plate blocking beams, where used, shall be secured to, and mounted on top of, overhead beams, machine beams, or on top of auxiliary beams connected to the webs of overhead beams. Hitch plates, blocking beams or auxiliary

beams shall be secured by bolting, riveting, or welding, and shall be so located that the tension in the hoisting ropes will not develop direct tensions in the bolts or rivets. Bolts shall conform to American National Standard G38.5-1969 (ASTM A307-68), American National Standard Specification for High Strength Bolts and Structural Steel Joints, Including Suitable Nuts and Plain Hardened Washers, G38.6-1972 (ASTM A325-71a), or American National Standard Specifications for Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints, G24.19-1972 (ASTM A490-71). Rivets shall conform to American National Standard Specification for Steel Structural Rivets, G42.2-1968 (ASTM A502-65). Welding shall conform to American Welding Society, Structural Welding Code D1.1. Where bolts and rivets are subject to shearing stresses due to tensions in the hoist ropes, the total shear shall not exceed 8,600 lb./in.² of actual area in the shear plane. Except where friction-type connections are used in accordance with American National Standard G38.6-1972 (ASTM A325-71a) and American National Standard G24.19-1972 (ASTM A490-71), the allowable stresses per Section 1604.7(a)(5)(A) shall be used.

The stresses in welds due to tensions in the hoisting ropes shall not exceed 12,000 lb./in.² based on the throat area of the weld.

The hitch plate supporting beams shall be designed to withstand twice the sum of the tension in all hoisting ropes attached to the hitch plates.

Total stresses in tension plus bending in hitch plates and hitch plate shapes shall not exceed 12,000 lb./in.²

EXCEPTION: Bolts made of steel having a greater strength than specified by American National Standard G38.5-1969 (ASTM A307-68) may be used and the maximum allowable stresses increased proportionally based on the ratio of the ultimate strengths. Elongation must conform to the requirements of the corresponding American National Standard.

(D) Cast Metals in Tension or Bending.

Cast metals having an elongation of less than 20% in a length of 2 inches, which are subject to tension or bending, shall not be used to support machinery or equipment from the underside of overhead beams or floors.

(5) Allowable Stresses for Machinery and Sheave Beams, or Floors and Their Supports. The unit stresses for all machinery and sheave beams, and floors and their supports, based on the loads computed as specified under Section 1604.7(a)(2), shall not exceed 80 percent and the unit stresses in tower or mast structures shall not exceed one hundred percent of those permitted for static loads by the following standards:

(A) Structural Steel. AISC Specification for the Design, Fabrication and Erection of Structural Steel for Building.

(B) Reinforced Concrete. Building Code Requirements for Reinforced Concrete ANSI A89.1 (ACI 318). Where stresses due to loads other than hoist loads, supported on the beams or floor, exceed those due to the hoist loads, 100 percent of the permitted stresses may be used.

(b) Flooring Over Hoistway. Where the hoisting machine is installed at the top of the hoistway, a solid floor shall be provided for maintenance, inspection, and lubrication. The floor shall be of 2-inch plank, or the equivalent, secured against movement with guardrails installed on all open sides. Where the hoisting machine is located at the bottom of the hoistway suitable access shall be provided for maintenance, inspection, and lubrication of top cathead and sheaves.

Federal and Other Standards:

1926.552 Material hoists, personnel hoists, and elevators.

1926.552(a) General Requirements

1926.552(a)(1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a professional engineer competent in the field.

Proposed Changes:

The Petitioner requests the following changes:

1604.1 (c) Engineering Supervision.

“(1) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. Where manufacturer's specifications are not available because the manufacturer is no longer in business or operating, the limitations assigned to the equipment shall be based on the determinations of a professional engineer licensed in California and competent in the field. Notwithstanding the foregoing the employer shall not in no event directly or indirectly modify, change or circumvent any manufacturer's published product or design specifications”

Proposed addition of new subsection 1604.20

1604.20(i) Permanently Enclosed Governors.

“Speed governors that cannot be internally inspected through inspection plate shall be replaced by the owner in accordance with the instructions on the manufacturer's data plate. The plate shall state: REPLACE UNIT BY (Month, Day, Year).”

Proposed new subsection 1604.27

“1604.27(c) Rack and Pinion Safety. Where the car and/or counterweight safeties are sealed to prevent field adjustment and examination, they shall only be returned to the manufacturer for replacement of components and calibration at the interval recommended by the manufacturer. A data plate shall be installed to show the date that the next maintenance/calibration is due.”

Discussion:

Senior Safety Engineer Larry McCune contacted the petitioner Joel A. Goldman, Alimak Hek, Inc., as well as other rack and pinion hoist manufacturers, some CPH owners and Dan Barker of the Elevator Unit to evaluate the subject petition. There has been an ongoing involvement of the Elevator Unit in the evaluation of third party testing and recertifying of CPHs overspeed governors and safety devices. The companies involved have presented their engineering and test procedures to the Elevator Unit and have been sealing/labeling the devices identifying their own company labels and replacement dates. This procedure was permitted because the manufacturer's specifications were not made available for the overspeed brakes and safety devices. The manufacturer has asserted that the specifications are proprietary.

The petitioner indicated that they had dismantled and tested a reconditioned overspeed brake device that had been and resealed by a third party company. Alimak has provided evidence to the Division that the parts that are normally replaced by the Alimak factory in Sweden were not replaced and that the parts did not meet their specifications.

Presently the manufacturer's procedures require hoist owners to ship their governor systems to Alimak in Houston, Texas for an exchange replacement or to the factory in Sweden for reconditioning and testing. Alimak does not have a testing facility in the US. The manufacturer's procedures include stamping a date on the exterior of the unit, which is used to determine the date in the future by which the unit must be replaced or tested. The recent slowdown in construction left many units on the shelf, unused, when that date occurred. . In some cases hoist owners received replacement parts showing Alimak that a significant amount of the permitted use time had already passed. Hoist owners have also reported delays in replacing the date-expired overspeed brake units. If the service life of the unit were based on operating hours it would more realistically track the actual use of the unit.

Presently the Elevator Unit inspects, drop tests and issues annual operating permits for each CPH used in California. The installations are retested each year and the safe operation is witnessed by a qualified elevator inspector. In questioning Alimak, retrofit manufacturers and hoist owners there have been no reported failures of third party reconditioned or remanufactured over-speed devices.

The companies that recondition hoist governors have stated that they perform their evaluation and testing based on their own engineering and test specifications followed with resealing and replacement date labeling under their own company name. US Hoist in Chicago designs and manufactures rack and pinion construction personnel hoists or permanent hoists, and manufactures or reconditions over-speed devices, brakes and related parts under their own brand name. The representative of US Hoist states that they use the same or equivalent parts as are provided by Alimak.

Access Equipment in Orcas, Washington also states that they recondition, test and seal CPH over-speed brakes according to specifications prepared by a California Registered Professional Engineer experienced in the design of such equipment. The third party reconditioned or over-speed brake assemblies are sealed, labeled and expiration dated with the third party name.

Conclusion:

The Division agrees that the manufacturer may have more consistent quality control of replacement or reconditioning of over-speed brake parts. If the petition were granted it would have substantial impact to limit the repair, servicing and testing CPH governors and parts to only the manufacturer of the rack and pinion hoist. There are several hoist manufacturers involved in Canada, Asia and Eastern Europe, retrofit manufacturer/suppliers, CPH owners and building contractors are also involved in this issue. The petitioner refers to a 2007 version ANSI A10.4 that has not been adopted by the OSHSB requiring a replacement component to be labeled by the certifying organization. It is not clear what certifying organization would label such parts or components as meeting the requirements of the ANSI standard other than the manufacturer or the entity reconditioning the device.

The Division recommends that the petition be granted to the extent of forming an advisory committee of interested parties to evaluate the proposed change to the Construction Safety Orders.

cc: Larry McCune, SSE
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